SOURCE SELECTION STATEMENT FOR THE CREW EXPLORATION VEHICLE PHASE 2 CONTRACT NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

INTRODUCTION: SOLICITATION AND PROSPECTIVE CONTRACT

On August 30, 2006, I met with members of the Source Evaluation Board (SEB or the Board) appointed to evaluate proposals for the Crew Exploration Vehicle (CEV) Phase 2 contract. The purpose of the meeting was for the Board to present the results of their evaluation of proposals to me as the CEV Source Selection Authority (SSA). Also present at the August 30 meeting were several other officials of the National Aeronautics and Space Administration (NASA).

Contracts for CEV Phase 1 were awarded competitively on June 24, 2005, to Northrop Grumman Integrated Systems (NG) and Lockheed Martin Corporation, Space System Company (LM).

To differentiate the type of activities that comprise the Phase 2 contract, NASA has developed multiple schedules of work. Schedule A is Design, Development, Test, and Evaluation (DDT&E) of the CEV from 2006 to 2013. This includes production of the first actual flight module of the 1A (a crewed, pressurized vehicle variant for low earth orbit missions) and 1B (an uninhabited, pressurized vehicle variant for International Space Station [ISS] re-supply missions) variants of the vehicle. Schedule A incorporates both completion form and indefinite delivery, indefinite quantity (IDIQ) contract provisions. Schedule B is an option for Production of the CEV from 2009 to 2019. It is an IDIQ mechanism under which NASA can issue delivery orders as fixed price (FP) or cost plus incentive fee (CPIF) for production of all variants of the vehicle (including a crewed, pressurized vehicle for lunar missions) following first flight of each specific variant. Schedule C is an option for Sustaining Engineering for the CEV from 2009 to 2019. It is an IDIQ provision under which NASA can issue cost plus award fee (CPAF) delivery orders for sustaining engineering to support production and operation of the CEV

A draft Request for Proposals (RFP or solicitation) was issued November 22, 2005. On January 11, 2006, the final RFP was posted. Proposals were due on April 20, 2006, and timely proposals were received from the CEV Phase 1 contractors, namely NG and LM.

Prior to the issuance of the solicitation, the SEB designated four Mission Suitability evaluation subfactors. The solicitation described these subfactors and listed the relative importance and weighting of each as set forth below:

Technical Approach	450
Management Approach	350
Safety and Health Plan	100
Small Disadvantaged Business Participation	100

In addition to Mission Suitability, the solicitation identified and the SEB accordingly evaluated Cost and Past Performance as selection Factors. These Factors were not numerically rated. The solicitation also provided for downward adjustment of offerors' Mission Suitability ratings up to 300 points based on cost realism for Schedules A and C, which was defined as the Board's process of independently reviewing and evaluating specific elements of each offeror's proposed cost estimate to determine whether the amounts proposed: (a) were realistic for the work to be performed; (b) reflected a clear understanding of the requirements; and (c) were consistent with each offeror's technical and management approaches.

In accordance with the solicitation, the SEB evaluated the high level data requested and assessed whether the proposed Not to Exceed (NTE) prices in Schedule B are realistic. If it were determined that the proposed prices were unrealistic either due to an error, flawed assumptions or inconsistency with the Management or Technical Volume, a mission suitability weakness or deficiency was assessed under management or technical, respectively, as a performance risk.

The solicitation stated that all evaluation factors other than Cost or Price, when combined, are significantly more important than Cost or Price. Mission Suitability is more important than Cost, and Cost is more important than Past Performance.

SUMMARY OF EVALUATION AND ANALYSIS OF PROPOSALS

After a preliminary review of all proposals, the SEB determined that both of the proposals were acceptable. The SEB then performed a thorough evaluation of the proposals. Based on deviation authority approved on January 24, 2006, no competitive range was established, and both offerors remained in the competition through final selection.

Accordingly, after evaluating the offerors' proposals, the Board invited both offerors to participate in written and oral discussions, and both were given the opportunity to correct, clarify, substantiate, or confirm the contents of their proposals and to submit a final proposal revision as well as a signed model contract reflecting the offerors' intent to be bound contractually. After considering the results of the written and oral discussions and final proposal revisions, the Board concluded its final evaluation and ranked the proposals in the following order of Mission Suitability ratings:

LM
NG

The proposal of LM was rated the higher of the two, receiving an overall Mission Suitability rating of Very Good. On the sub-factor level, LM's proposal was determined to be Very Good in Technical Approach; Good in Management Approach; Good in Safety and Health Plan; and Good in Small Disadvantaged Business Participation.

Significant strengths were: several sound, effective, and realistic concepts for avionics and software development, which abate both schedule and technical risk; and incorporation of proven operations considerations and innovative technologies into the design of the spacecraft and operational processes which significantly increases operability and reduces life cycle costs.

In addition to LM's two significant strengths, there were numerous other strengths reported, no significant weakness, and three weaknesses. The reported weaknesses are that the proposed baseline does not contain sufficient resources to produce Service Module Main Engines (SMME) for pressurized cargo flights for Block 1B; that the unsubstantiated technical resources (Full Time Equivalent and Non-Labor Resource) reductions across Final Proposal Revisions (FPR) Schedules A, B, and C add risk; and that Operations Data Requirement Documents (DRDs) were inappropriately costed under IDIQ.

The proposal of NG also was rated as Very Good overall in Mission Suitability. On the sub-factor level, NG's proposal was determined to be Very Good in Technical Approach; Good in Management Approach; Good in Safety and Health Plan; and Good in Small Disadvantaged Business Participation.

The NG proposal had one significant strength for its proposed Crew Module (CM) pressure vessel design which significantly reduces production time and schedule risk. In addition to its one significant strength, NG's proposal had several strengths, no significant weaknesses, and three weaknesses. The reported weaknesses are that proposed software production rates are high and unsubstantiated; that the re-use claims for flight and test software are unsubstantiated and unrealistic; and that the delivery date of Command and Data Handling (C&DH) and Displays and Controls (D&C) hardware shipsets to the NASA training facility does not allow sufficient time for integrated training prior to first CEV flights.

The Board performed the cost analysis contemplated by the solicitation, made the necessary adjustments to the costs proposed, and arrived at a probable cost for each offeror. The evaluated probable cost of LM's proposal was appreciably lower than the evaluated probable cost of NG's proposal. The probable cost adjustments did not result in a Mission Suitability offset for either of the proposals. I discussed in detail the method of cost analysis with the Board to assure myself that any adjustments were both sound and consistent with the offerors' respective approaches. The Board's probable cost analysis showed that the proposed cost figures for both proposals were realistic, and that the probable cost did not differ significantly from their respective proposed cost figures.

The Board evaluated of the offerors' past performance was evaluated in two phases. First, the Board considered pre-Phase 1 Past Performance information consisting of the past performance evaluation from the Phase 1 source selection. Second, the Board considered post-Phase 1 award Past Performance information consisting of Phase 2 RFP submissions and Phase 1 contract performance. LM received an overall Past Performance rating of Very Good. LM received a significant strength for its Phase 1 management team's exceptional responsiveness to NASA and its anticipation of actions. LM received six strengths and no weaknesses. NG received an overall rating of Good and received no significant strengths, four strengths, and no weaknesses.

During the presentation by the Board, the various NASA officials present, along with members of the Board, were encouraged to provide me with their opinions and comments regarding the Board's findings. I probed the Board members regarding their rationale behind various findings, and I was satisfied with the quality and results of all their analyses. In examining and comparing all of the findings, some balanced each other out between the proposals, some of the rest were of lesser consequence to me, while others were discernable discriminators. In examining the findings of the SEB and the relative rankings of the two firms in the Mission Suitability subfactors, including the various strengths reported for the offerors, I made a qualitative assessment of the benefits to the Government arising from the strengths as well as the risk to successful contract performance represented by the remaining weaknesses. In reviewing the Final Report presented to me, I was satisfied that the Board had done a thorough job of evaluating the proposals and that overall its findings were sound.

DISCUSSION OF FINDINGS AND ANALYSIS OF PROPOSALS

Technical Approach

My initial comparison of the two proposals was in the Technical Approach subfactor. As a framework for my deliberations, I noted that both LM's proposal and NG's proposal were rated as Very Good. The numerical rating of the LM proposal was somewhat higher than that of NG. Moreover, I noted that the LM proposal had two significant strengths and eighteen strengths in this area, as opposed to NG's one significant strength and twelve strengths.

Turning to the qualitative aspects of the two proposals under this subfactor, I first examined their similarities. Both offerors had comparable strengths for approach to automation. A strength was assessed by the SEB for LM's sound approach to implementing CEV automation which reduces overall program risk. LM plans to implement a meaningful and realistic level of automation and autonomy, balanced against current technology readiness levels. This approach has value to the Government because of its potential for reducing overall program risk by ensuring that the initial vehicle design and development take place within a feasible technological scope, with clear follow-on objectives to incorporate appropriate advances in a realistic way. By applying lessons learned from previous projects and having a systematic approach to automation, LM's approach ensures NASA's limited resources can be targeted to those areas reaping the highest benefit from automation. NG provides a sound approach to implementing CEV automation which creates benefits to the Government including improved crew safety, reduced workload, and reduced Life Cycle Cost (LCC). NG proposed a realistic approach to implementing automation which has potential to reduce overall program risk. The improvements and additions to automation can be systematically added to the CEV over its lifetime and therefore the Project will not necessarily have to wait for large advancements in automation before taking advantage of incremental improvements. This approach is considered a strength in the NG proposal. Regarding these strengths, I concluded that although they offered value to the Government, each of the relative values of these strengths was balanced by the other such that they were not discriminators.

A second comparable strength, under this subfactor, was noted for desktop simulation capability. LM received a strength for proposing implementation of a proven desktop simulation and automation capability which will increase efficiency and reduce risk for CEV Project development. The LM approach will significantly increase the productivity of hardware testbeds; increase the quality and efficiency of flight software development by allowing subsystems hardware and software integration and testing to be conducted in a virtual environment; increase of the quality of testing that involves real hardware by reducing test problems, which reduces project risk and shortens test times, which in turn reduces costs; and reduce the common problem of simulator availability. NG received a strength for proposing a beneficial software development simulation capability. The NG approach allows the actual flight software and models to run in a desktop computer environment. The flexibility afforded by the NG approach allows the Government to develop cost-effective trainers without needing to procure specialized computers. Regarding these strengths, I concluded that although they offered value to the Government, each of the relative values of these strengths was balanced by the other such that they were not discriminators.

A third comparable strength, under this subfactor, was noted for Ground Support Equipment (GSE.) LM's approach to providing common Ground Support Equipment (GSE) across flight elements and ground processing phases is a proposal strength in that it is both comprehensive and effective and will result in more efficient ground processing and decreased life cycle costs. In addition to designing GSE for maximum commonality, the LM approach also assesses existing material equipment lists for existing programs for any GSE hardware items or designs that can be re-used for CEV. This along with the common GSE approach is beneficial to the Government in that it shows a commitment by LM to reduce lifecycle costs associated with GSE in the most efficient manner possible. NG's strengths reported by the Board included a proposed beneficial field-to-factory approach to contractor-provided ground support equipment (GSE). This approach provides commonality of GSE between production and operational activities which benefits the Government because it will decrease overall design and development costs. This approach also promotes the use of standardized spares with the "field-to-factory" GSE which will decrease overall logistics costs. Regarding these strengths, I concluded that although they offered value to the Government, each of the relative values of these strengths was balanced by the other such that they were not discriminators.

A fourth comparable strength, under this subfactor, was noted for crew module reuse approach. The LM proposed crew module reuse approach provides total mission life that exceeds the requirements for the manifest and enhances value and flight manifest flexibility. The additional mission life provided by the proposed approach provides benefit to the Government by offering flexibility in the approach to satisfying the CEV lifecycle flight manifest, providing the option of additional CEV flights using Schedule A/B CM assets, and reducing risk by enabling a CM spares approach. A strength was assessed to NG for the crew module reuse approach proposed which provides additional mission life that exceeds the Project requirements and enhances value and flight manifest flexibility. The additional mission life achieved through the proposed Crew Module (CM) reuse approach provides benefit to the Government by reducing the need for additional CM production downstream in the CEV life cycle, enabling additional ISS crew and cargo flights, and providing margin to help compensate for potential loss of CM reusability. Regarding these strengths, I concluded that although they offered value to the Government, each of the relative values of these strengths was balanced by the other such that they were not discriminators.

A final comparable strength, under this subfactor, was noted in the area of flight tests. The LM proposed flight test plan combined with an extensive ground test program effectively achieves test objectives while accelerating the development schedule. Each flight test progressively retires remaining technical risks and validates the operational aspects in preparation for the ISS-1 flight. This approach is of value to the Government because it effectively accomplishes early reduction in risk through extensive ground testing and consolidation of flight test objectives. The proposed NG baseline flight test schedule was evaluated as a strength in that it takes advantage of two launch ranges working in parallel to accelerate the schedule of the first human CEV launch. This is of value to the Government because it takes advantage of two flight test centers working simultaneously and conducts the launch abort system flight tests in parallel with integrated spacecraft and launch vehicle flight tests, thus minimizing schedule impacts. Regarding these strengths, I concluded that although they offered value to the Government, each of the relative values of these strengths was balanced by the other such that they were not discriminators.

In examining the differences between the two proposals in the Technical Approach subfactor, I first noted that LM had two significant strengths which had no comparable strength or significant strength in the NG proposal. The first of these was that LM proposed several sound, effective, and realistic concepts for avionics and software development which abate both schedule and technical risk. These included a risk mitigation process to proactively and successfully address software development risks. Risk mitigation in this area is of great value to NASA due to the fact that software development typically is "the long pole in the tent" during vehicle development and testing. LM proposed a fifth generation avionics suite that is of a high technology readiness level. Its proposed use of technology derived from that currently being implemented in modern commercial aircraft has great potential for reducing CEV project risk and life cycle costs. The avionics architecture is an effective re-use of commercial/military hardware designs and architectures. This will increase the probability of success and lower implementation and design risks resulting in significant schedule and cost reduction to the Government. Further, LM proposed use of a modular software architecture that evolves with the vehicle's capabilities. This approach is consistent with NASA's objectives and greatly benefits the Government by providing long-term software maintainability/availability and extensibility. LM also proposed the use of a dissimilar, separate backup flight control system that is ready to assume control if the primary system fails. This is of substantial value to the Government because it provides dissimilar redundancy and a sound approach exceeding the minimum requirement for a two fault tolerant avionics system thus decreasing operations mission risk to the Government. The LM proposal demonstrates extensive experience in time/space partitioning software architectures that will reduce schedule and cost risks to the Government. The LM approach of a simple and effective software reload during flight capability likewise avoids the complexity of updating software. This coupled with the use of a simple, but effective, flight-to-flight reconfiguration process is of value to the Government due to its effectiveness in streamlining the software reconfiguration process and reducing recurring costs. The LM approach provides a two-fault tolerant Communications and Tracking (C&T) subsystem which exceeds the Government's requirements and is beneficial from an operational standpoint. LM further proposed provisions for an integrated framework that will support and streamline avionics and flight software DDT&E. This approach demonstrates detailed and effective consideration for integration from the beginning and represents a significant benefit to the Government by reducing schedule and technical risks.

The second significant strength was that LM's proposal significantly increases operability by incorporating proven operations considerations and innovative technologies into the design of the spacecraft and operational processes. These included the execution of proven Operations Requirements Analyses and Operational Assessment Analyses to analyze lessons learned, design requirements related to operability, and new methodologies and technologies. LM's clear and comprehensive process for the incorporation of operations considerations into the CEV design beginning at the earliest stages of requirements development and will significantly increase the efficiencies of both the flight and ground operations organizations and reduce overall life cycle costs. Combined, all of these represent great value to the Government in that they will enhance both quality and efficiency, ensuring optimum contract performance.

In the area of strengths, LM's proposal was assessed a strength for its proposed strategy for the integrated test and verification of the CEV spacecraft which is comprehensive, clear, and effective, such that project risk associated with CEV integrated test and verification will be reduced. Prominent aspects of this strength were that the LM approach recognizes and addresses the need for requirements validation to be iterative, thus ensuring the design will meet mission objectives. This will allow the earliest possible identification of overlooked or emerging requirements issues, minimizing the risk of costly design changes late in the development cycle. Moreover, LM's requirements verification matrix is detailed and comprehensive reflecting a mature test and verification strategy early in the project. This is of value to the Government because it will reduce project risk and increase the accuracy of test and verification cost estimates. In addition, the proposed LM approach reflected a mature verification strategy early in the project, which is beneficial to the Government in that it will reduce project risk and increase the accuracy of various cost estimates. LM also proposed structuring the test planning process to fully address project risk as a major driver which will maximize test effectiveness. LM further proposed an emphasis on requirements ownership at the position/individual level, ensuring that it is established early and maintained through system level certification. Establishing clear responsibility and accountability for validating and verifying project requirements in this way is of value to the Government because it increases confidence in the requirements verification closure process. Finally, LM included detailed checkout in its test planning, adding in the comprehensiveness of this aspect of its proposal.

The Human Engineering Process proposed by LM was assessed a strength due to its comprehensive and highly effective approach to the incorporation of CEV human system interface requirements. The proposal detailed a step-by-step approach which is both effective and which exceeds traditional human engineering levels of involvement. LM also proposes an effective human engineering development laboratory capability which will address operational, maintenance, and integration issues as they arise. LM's heightened attention to CEV human system needs is comprehensive and beneficial to the Government in that early recognition of human engineering threats allows for planned adaptation to crew interfaces changes later in the CEV development cycle.

LM's proposal was assessed a strength for its proposed sound and enhanced risk management approach of Spacecraft Survivability Engineering (SSE) to address the design and implementation of opportunities to increase spacecraft survival. LM's application of SSE to human spaceflight complements System Safety and Crew Survival analysis groups to ensure all threats and hazard consequences to the completion of the mission are analyzed and that all sources of uncertainty are identified and minimized. The LM approach identified the vulnerabilities and areas where the spacecraft can incorporate robustness into design and operation. This is of decided value to the Government because it will produce a more effective and comprehensive spacecraft design directed toward increased crew survival and could lead to additional beneficial survivability standards.

The LM proposal received an additional strength for its demonstrated comprehensive, well-developed, and highly-disciplined approach to system engineering and integration using formal, structured systems that are known and proven in the industry. LM also applies formal training, evaluation, and rating systems to its team members to ensure the systems used are constructive and productive tools. This is of benefit to the Government because the approach, which goes beyond the requirements of the contract, is expected to reduce project risk.

LM proposed an approach for design and validation of the Launch Abort System (LAS) which is comprehensive and effective and which is beneficial to the Government because it provides early risk reduction through analyses and ground testing. The LM approach combines active and passive LAS, and it offers the additional potential benefits of weight savings, control of acceleration loads, adaptation to CM center of gravity location, and more precise guidance than passive LAS alone. LM also proposed a range of analyses and ground tests to reduce the risk level from high to low before the beginning of the Abort Test Flights and Risk Reduction Flight tests. This is of value to the Government because it will maximize system performance while minimizing schedule risk. The approach is sound, reduces risk prior to the start of flight testing, places less dependency on flight tests to reduce risks, enhances the probability of successful flight test, and supports LM's proposed streamlining efforts.

LM proposed to build and test an engineering development structure prior to Critical Design Review (CDR), which results in reduced overall spacecraft developmental risks and provides several advantages to the project. These include: early test verification of component environments which substantially reduces the risk that modification and retesting will be required later in the program; early modal test data which will result in an improved understanding of spacecraft loads and dynamics; and additional risk reduction which is established by allowing tooling and techniques to be tried out and improved upon prior to flight spacecraft assembly.

LM's proposed manufacturing techniques and materials for the crew cabin pressure vessel were deemed to be strengths because they will provide high performance while having low developmental risk. This is a benefit to the Government because LM's approach will result in mass savings, improved weld quality, and safety, with low development risk.

The LM approach for installation of a landing attenuation system pyrotechnic ordnance late in the processing flow is beneficial to NASA because it will provide minimum impacts to ground operations activities. This has the benefit of reducing overall time the vehicle is "hazardous" which is beneficial to the Government because it will ease constraints on ground operations activities, and will also eliminate the need to certify additional facilities for handling large quantities of hazardous propellant.

A further strength was assessed for the LM proposed Service Module Main Engine improvements. Improvements included increased performance, production enhancements, and failure tolerance, all of which offer benefit and value to the government in terms of mission success, safety, and reduced life cycle costs. The proposed LM enhancements include increased performance and thrust, reduction in SM usable propellant mass, improved manufacturing process, elimination of the need for certain testing, and parallel redundancy making the SMME single failure tolerant for function.

LM's Exploration Development Laboratory was assessed as a strength and is of benefit to the Government for enhanced risk mitigation in several key areas. These include display prototyping/human interfaces, Guidance, Navigation, and Control (GN&C) software integration, Automated Rendezvous and Docking advanced development, and hardware/software integration. This early, added attention to these key areas is beneficial to the government from both a technical and schedule risk mitigation aspect. In addition, this lab can be used to perform system-level testing earlier in the development cycle.

The LM approach for developing a dedicated qualification test article was an additional proposal strength. The approach enables delta-qualification testing to address measured flight environments and is beneficial to the Government because it enables expansion of the CEV operational envelope. This approach is further beneficial because it facilitates the ability to perform CEV delta-qualification testing to assess actual flight environments that differ from the original spacecraft design/qualification environments, as well as the ability to stress the qualification article to environmental extremes to determine its breaking point. In addition, this approach will provide access to a high fidelity test article to perform in-flight anomaly assessment, and access to a high-fidelity CEV to enable a rapid and comprehensive evaluation of CEV hardware and software modifications associated with obsolescence mitigation, advanced technology insertion, and block upgrades.

The LM proposal was assessed an additional strength for its demonstrated comprehensive recognition of and planning for risks and watch items, which indicate a sound understanding of CEV development threats. Risks and watch items are identified for each technical area, and mitigation plans and potential impacts are acknowledged for these risks. Examples include early recognition of threats to crew interfaces, schedule interdependencies that could impact progress, full communications operations, key critical performance measurements for crew survival, and a comprehensive propulsion development and verification test program. The demonstrated sound understanding of CEV development threats at integrated and technical discipline levels is beneficial to the Government in enhancing overall project success.

LM's approach for developing Failure Modes and Effects Analysis/Critical Items List (FMEA/CIL) documents and using the Reliability Block Diagram Analysis (RBDA) continually to reduce project risks through linking several critical databases is highly effective and sound for identifying and reducing project risks. This approach is beneficial to the Government because it will improve utility of information and increase the efficiency of accessing the data, which will result in an overall reduction in risk and enhance the probability of excellent CEV contract performance.

LM was assessed three weaknesses in the Technical subfactor. In the first weakness, although LM identified cost and schedule impacts for additional SMME production associated with the effort, it did not incorporate SMME production cost impact into its baseline cost as agreed at discussions. A second weakness was assessed as a result of unsubstantiated technical resources Full Time Equivalent and Non-Labor Resource (FTE and NLR) reductions across Schedules A, B, and C. This lack of adequate supporting rationale to justify the reductions is perceived as a risk to performance. The third remaining weakness was for LM's Operations Data Requirement Documents (DRDs), which were inappropriately costed under IDIQ, resulting in underestimation of its costs while increasing project risk by reducing available critical IDIQ support resources.

Turning to the NG proposal, the Board assessed one significant strength in the Technical Approach Subfactor: NG's proposed CM pressure vessel design significantly reduces production time and schedule risk. The concept contributes to reducing CM production time making it much faster than that of Apollo. This allows schedule time to be allocated to other areas more susceptible to schedule risk. The NG approach also improves the safety of crew and equipment while also reducing the likelihood of induced damage to flight hardware during the installation process. This approach enables the optimization of equipment assemblies for reduced parts count and improved mass efficiency. This concept is effective in reducing the time required to troubleshoot anomalies encountered, facilitating functional testing by providing ease of access to internal components after they have been integrated into the structure. The concept also demonstrates NG's commitment to designing for efficiency in integration, assembly, test, and checkout. NG provided additional information concerning the benefits of the proposed pressure vessel design. For this reason, this strength was increased to a significant strength. Overall, this is of great value to the Government because it maximizes designing for efficiency in integration, assembly, test, and checkout.

NG's detailed and well described Boundary Layer Transition (BLT) estimation procedure shows understanding of the complex phenomenon and is of value because it will help produce an optimum thermal protection system thickness and reduce spacecraft weight. NG thoroughly addressed the technical complexities inherent in the BLT prediction and proposed a detailed, iterative procedure to accurately account for its effect on aeroheating and hence in determining the thickness of the Thermal Protection System (TPS). NG proposed an increasingly complex and higher fidelity approach as the design progresses from conceptual to a detailed stage. The value to the Government is an accurate prediction and accounting of the forebody transition which increases the accuracy of predicting aerodynamics, which in turn produces more accurate inputs for other disciplines such as GN&C and structures.

The NG proposal provides early developmental software which was evaluated as a strength and which benefits the Government because it permits earlier access to working software products. This will allow the Government to build a risk mitigation facility/capability. In addition, the simulation and training personnel will be able to use these early development software drops to begin work on simulator and trainer additions/modifications.

The NG proposed development of a standard components and parts library for ground support equipment which reduces logistic costs. By reducing the types and quantities of GSE spares, this results in a reduced logistics impact and increased commonality. Limiting the proliferation of these parts is of value to the Government because it will help minimize the overall logistics footprint and reduce logistics costs.

An additional strength was identified for the NG coordinated approach and application of state-of-the-art technologies which increases ground operations effectiveness: The NG proposed approach and innovations will result in the overall decrease of life cycle cost by streamlining operations activities and ensuring the required resources are available to support the project in a timely manner. The Logistics Management System is of value to the Government because it incorporates innovative technologies and also allows a seamless exchange of data between the contractor, subcontractors, and suppliers. Additionally, the NG approach for Line Replaceable Unit (LRU) placement within the Crew Module will enhance refurbishment and operations timelines.

NG also proposed a sound approach to use experienced flight operations and Mission Evaluation Room (MER) engineering support personnel to influence operability in the design process and support real-time flight operations. NG's demonstrated depth of experiences in Shuttle and ISS flight operations enhances its ability to understand flight operations needs and provide relevant support. This is of value to the Government in that it will enhance contract performance by optimizing existing resources.

The NG proposed design, development, and testing approach for CEV Launch Abort System is sound, effective, and addresses risks. This approach offers the potential benefits to the Government of weight savings, g load control, adaptation to Crew Module center of gravity offsets, and more precise guidance in comparison to a passive system such as that used for Apollo.

The final strength in the NG proposal noted by the Board in the Technical Approach subfactor was that the proposed Flight Test Article production employs a rolling spare concept to ensure the flight test schedule is maintained. This concept supports reuse and parts sparing, and limits design and manufacturing differences. The proposed Flight Test Article is designed with large margins to reduce verification effort and enhance safety and test success. The NG approach is of value to the Government in that it will measurably enhance and improve the probability of successful contract performance.

NG was assessed three weaknesses by the SEB. The first was that the proposal data revealed software production reuse claims which are high and unsubstantiated in NG's proposal. A second weakness was assessed as a result of NG's proposed re-use claims for flight and test software which are unsubstantiated and unrealistic. Display prototyping and cockpit development resources were considered notably lower than those used in comparable projects. A third weakness was assessed for updated delivery dates identified in the FPR of Command and Data Handling (C&DH) and Displays and Controls (D&C) hardware shipsets to the NASA training facility. The delivery dates in NG's proposal are unreasonable because the delivery is too late to allow integrated training prior to first CEV flights thus creating a risk to the Government concerning the ability to execute flights. From a development perspective, the most challenging aspect of bringing a new trainer on-line is making the C&DH system work. There is no expectation, with a delivery of only sixteen months prior to the first crewed flight, that the C&DH and D&C can be fully integrated and tested in time to support any integrated training. The possibility of not having a simulator in time to use it for flight preparation is a major risk to the Government and would likely force a delay of the baselined launch schedules by many months.

In comparing the two offerors in the subfactor of Technical Approach, I was impressed with the substance, quality, and value of LM's significant strengths. I noted several aspects of LM's Technical Approach that differentiate it from NG's Technical Approach in a meaningful way. These discriminators are substantial and beneficial to the Government and are among the bases of my selection decision. Specifically, LM's incorporation of proven operability and innovative technologies into its design results in a demonstrably proactive and innovative thought-process that would be beneficial to NASA's effective and cost-efficient implementation of the CEV Project. Moreover, LM's approach to avionics and software development is sound and realistic, and it is a discriminator that also influenced my selection decision. LM's approach showed innovation and use of more state-of-the-art and evolvable avionics. LM's proposal persuaded me that LM is better equipped to address the technical and schedule challenges associated with both avionics and software development. Further, LM's proposed Spacecraft Survivability Engineering approach is impressive in that it systematically addresses risks as well as the severity and consequences of those risks should a hazard occur and improves robustness in design in selectively identified areas of risk.

I also took note of the companies' various remaining weaknesses in this area. LM's weaknesses were assessed for relatively minor discrepancies and unsubstantiated reductions in its proposed resources. LM's costs were adjusted to correct these reductions and therefore are reflected in the probable cost. On the other hand, while two of the three NG remaining weaknesses also represented resource issues, the third weakness remaining in the NG proposal represented a more discernable risk to the Government and potential adverse impact to the performance of the CEV contract in the critical area of timely delivery of training hardware shipsets. I therefore considered the weaknesses of NG's proposal to be more substantial and, hence a potentially greater threat to successful performance, than those of LM's proposal.

I determined that the proposal of LM represents a substantial advantage to the Government over that of NG in the Technical Approach subfactor. I concluded that the specific qualitative differences between the Technical Approaches of LM and NG comprise a greater disparity between the two proposals in the Technical Approach subfactor than is reflected in the respective ratings of the proposals. That disparity and the specific aspects of LM's Technical Approach identified in this selection decision as discriminators are consequential in my selection decision-making. Overall, LM demonstrated more forward-thinking yet sound design concepts in its proposal than did NG.

Management Approach

I next compared the offerors in the subfactor of Management Approach. From a ratings standpoint, I took note that both the LM proposal and the NG proposal were rated as Good. LM's proposal had no significant strengths and seven strengths in this area. NG's proposal had no significant strengths and seven strengths in this area. Neither offeror had any remaining weaknesses in this subfactor.

In examining the relative strengths of the two offerors in the Management Approach, both offerors received a comparable strength for weekly earned value schedule visibility, which will increase the likelihood of a favorable schedule and cost outcome. This will benefit the Government by providing earlier visibility into technical problems than will the required monthly frequency by identifying emerging variances for earlier corrective action. Regarding these strengths, I concluded that although they offered value to the Government, each of the relative values of these strengths was balanced by the other such that they were not discriminators.

Turning to the individual strengths of each offeror's respective Management Approach, LM received a strength for its proposed innovative business strategy which provides a financial incentive during Schedule A to reduce project execution risk. This strategy ensures that the offeror is mission success oriented.

LM incorporates comprehensive streamlining innovations in the baseline project plan leading to an accelerated first crewed launch. The proposed approach uses proven structured streamlining processes which have been successfully used on previous NASA and Department of Defense (DOD) contracts. LM provided a thorough analysis of its ability to achieve the first crewed launch.

The LM incorporation of risk as a variable in their critical path schedule analysis provides early warning regarding items that may become drivers of the critical path. This reduces risk to the Government of schedule impacts due to identification of items that have potential to become critical path tasks.

An additional strength was assessed for the proactive contractor/NASA Government Furnished Equipment (GFE) Integration Team approach proposed by LM which will mitigate risks associated with GFE integration. LM proposed beyond the solicitation requirements and recommended a realistic and practical team structure that could be used to resolve issues brought forward by the joint GFE integration teams.

LM provided a comprehensive and thorough Performance Assessment Plan including margin management. LM addressed not only the initial set of metrics for the contract, but also addressed the follow-on metrics over the life of the project. Appropriate and timely use of proposed programmatic metrics can have a significant positive effect on meeting the stated goals of the CEV project and therefore is of value to the Government. LM clearly demonstrated a detailed and exceptional understanding of program/project management with the overall maturity above the requirements.

The final LM strength in this area was for use of an integrated management assessment tool to track cost and schedule. This will enable LM to manage schedule and cost proactively. The use of such a tool is very important given the environment in which CEV and the entire Constellation Program will be operating in over the next several years Use of this integrated management assessment tool is also of value to the Government in that it provides the ability to quickly respond to the early stages of a developmental project which will help in quantifying potential schedule problems that might arise as a result of program management decisions.

Turning to NG, a strength was assessed for its demonstrated strong commitment to the CEV contract start-up that will reduce schedule risk to the project by increasing the likelihood that critical resources are available to the project when required. This approach is of value to the Government because it will reduce schedule risk to the project by increasing the likelihood that critical resources are available to the project when required.

NG proposed use of incremental qualification in its streamlining plan, which will be effective in enabling early International Space Station 1 (ISS1) and International Space Station 2 (ISS2) missions. The NG approach recognizes the opportunity to exceed minimum mission schedule requirements by proposing to perform environmental qualification incrementally. This is an effective and sound contribution to the offeror's proposed streamlined approach which would be effective in that it exceeds the Government's minimum schedule requirements without incurring additional risk.

The Board assessed a strength for the schedule assessment tool proposed by NG which will provide greater insight into schedule and reduce risk. The approach provides mechanical checks on the linkage of schedule line items and produces error reports for updates, verifies the data for soundness, and incorporates risk into the schedule so that Monte Carlo analysis can be performed. The proposed use of this tool benefits NASA by providing greater insight into schedule and reduces risks based on the analysis.

NG's innovative opportunity process has potential to save Government money, improve safety, and improve on schedule and resources. The additional benefit to the Government is that this approach keeps process improvement in the forefront, and was a strength in the NG proposal.

NG proposed provision of NASA resident offices at major facilities, which is a sound approach to minimizing communication problems and decreasing project risks. This physical co-location capability, which is beneficial to the Government, is beyond the requirements of the contract, lowers project as well as program risks, and possibly reduces costs.

The final strength in this subfactor assessed to NG was for its approach to Life Cycle Cost (LCC) estimation and reporting, which will reduce cost risks. The NG approach incorporates LCC considerations into the CEV design process. Overall, NG's strength for managing LCC enhances the ability to provide technical review teams direct insight into design impacts on LCC.

As a result of the Board's evaluation of NG's initial proposal, the Board determined that NG had a weakness concerning its teaming arrangement with its major subcontractor. The teaming arrangement was unclear, increasing the risk to the Government because the prime-sub contractual relationship was not clearly defined. Although during Final Proposal Revision review the Board determined that NG had addressed the weakness by including a copy of the teaming agreement clarifying the arrangement between NG and its major subcontractor, I am concerned that two very large companies integrating and interacting as prime and sub will be a recurring management challenge. Such integration and interaction is important and, if not seamless, can be an overly burdensome contract administration issue.

In reviewing, comparing, and contrasting the substance of all of the strengths of both competitors in the Management Approach subfactor, I concluded that they each proposed a sound and workable approach for managing the CEV effort. LM demonstrates a more proactive management approach and I therefore conclude they are perceivably better than NG in this factor. In particular, although both offerors propose streamlining methodologies, I am more impressed by the streamlining innovations that LM incorporated in the baseline project plan and its day-to-day operations.

Safety and Health Plan

My analysis next turned to the subfactor of Safety and Health Plan. As noted above, LM was assessed to be Good in the subfactor of Safety and Health Plan, and NG was also assessed to be Good. In both cases, these adjective ratings were driven solely by the Safety Plans. In reading the detailed findings, it was apparent to me why there was a slight difference in the offerors' rating scores. NG's plan was evaluated as having no strengths or weaknesses.

LM's Safety Plan was rated somewhat higher and was rated with no significant strengths and one strength. The noted strength was that LM presented a plan which expanded beyond the requirements of the DRD representing a comprehensive program evaluation process that enhances the overall safety and health program. This has value to the Government in that it will further strengthen the overall safety and health program, which will reduce the potential for mishaps and incidents, and promote a safe work environment. Therefore, I concluded that LM had an advantage over NG in this area in that its plan represented greater value to the Government.

Small Disadvantaged Business Participation

The next subfactor which I reviewed was that of Small Disadvantaged Business Participation. Both proposals were rated as Good in this area. Both offerors were evaluated as having one similar strength. LM was assessed a strength for proposed Small Disadvantaged Business goals which exceed the solicitation's established goals. NG was assessed a similar strength for its proposed Small Disadvantaged Business subcontracting plan with goals exceeding the small disadvantaged business solicitation goals. The companies' adjective and numerical ratings were identical in this subfactor. I therefore concluded that the offerors were equal in this subfactor and that neither offered measurable value to the Government over the other.

Past Performance

The Board's evaluation of the offerors' past performance was evaluated in two phases. First, the Board considered pre-Phase 1 Past Performance information consisting of the past performance evaluation from the Phase 1 source selection. Second, the Board considered post-Phase 1 Past Performance information consisting of Phase 2 RFP submissions and Phase 1 contract performance. Under the Past Performance Factor, the Board rated LM as Very Good and NG as Good. The past performance evaluation from the Phase 1 competitive procurement indicated that LM programs had a mix of relevancy with generally good performance. In regard to their Phase 1 contract performance, LM was assessed a significant strength for its Phase 1 management team's exceptional responsiveness to NASA. In addition, LM was assessed six strengths in this factor during its Phase 1 performance including: a Program Management team that is very effective in integrating subcontractor participation into the CEV team; demonstrating efficient requirements flow-down from the Systems Engineering and Integration (SE&I) function to each of the affected subsystems; S&MA team's functions exceeded requirements, specifically in the areas of Hazards Analysis, Probabilistic Risk Assessment, and Failure Modes and Effect Analysis; demonstrating strong commitment to teaming and communication; demonstrating a strong commitment to schedule performance; and effectively using an existing earned value management system to track performance.

In comparison, the past performance evaluation from the Phase 1 source selection indicated that the NG development programs reviewed did not demonstrate relevant content. In regard to their Phase 1 contract performance, NG was assessed four strengths including: a robust Systems Engineering process; S&MA functions which went beyond requirements in some areas, specifically the Hazards Analysis; demonstrating a strong technical understanding in the area of spacecraft; and strong leadership capabilities along with very effective and sound process for managing trade studies to ensure effective results. In comparing the two offerors, including the detailed data supporting the findings, it was apparent that LM had an advantage over NG.

Although both LM and NG are competent contractors capable of performing the CEV effort, based on the SEB's and my own assessment of their relative strengths, I concluded that LM's past performance offered the greater value to the Government. In reaching that conclusion, I determined that LM's contract performance under its CEV Phase 1 contract was particularly relevant. LM's Phase 1 proactive performance and collaborative interaction with NASA during Phase 1 is a strong indication that LM would perform similarly during Phase 2. LM anticipated actions and emphasized quick turn-around. In my view, such responsive and proactive interaction between the Government and a contractor is essential to the success of a project. This characteristic will be evident and important every day in the execution of this project.

Cost

The cost proposals were evaluated consistent with the evaluation criteria in Section M of the RFP. A cost realism analysis resulting in a probable cost was performed for Schedules A and C. Consequently, the probable cost primarily included adjustments to correct for technical weaknesses. The Board performed a review of the Schedule B NTE prices to determine whether there were any potential performance risks as a result of unrealistic pricing.

The cost realism analysis resulted in LM's proposal containing a significant cost advantage over NG's probable cost. LM's advantage in this subfactor was worthy of consideration as a discriminator between the two proposals. The difference between the probable costs of the two offerors constitutes a substantial savings to the Government. The probable cost amount for both proposals did not diverge significantly from their respective proposed cost amounts. The Board's cost realism analysis demonstrated a high degree of confidence in the relative difference between the offerors' probable cost figures.

The review for performance risk performed on Schedule B did not result in material impacts to either offeror. The NG proposal did not contain identifiable risk associated with producing spacecraft in Schedule B. The LM proposal did contain identifiable areas that contained risk due to the lack of resources. Although this assessed risk was immaterial in nature, the risk was adequately captured in a mission suitability weakness. The proposed NIE values for each offeror were captured in the contract. This reinforced the confidence level I have in the relative difference between the offerors' NIE values proposed.

Overall, both offerors submitted very realistic cost proposals and only very minor probable cost adjustments were warranted or identified risks were captured as weaknesses. The LM proposed and probable cost represent a substantial advantage over the NG proposed and probable cost. This advantage provided by the LM proposal offers compelling value to the Government over the NG proposal.

Summary

All of the factors were important in my consideration of both proposals. I first examined Mission Suitability. As discussed above, the proposal of LM clearly was superior in the most heavily weighted subfactor, Technical Approach, in the substantive quality of both significant strengths and strengths. Although I considered all findings in my deliberations, I was particularly impressed with the numerous technical enhancements, the sound, effective, and realistic concepts for avionics and software development, and incorporation of proven operations considerations and innovative technologies into the design of the spacecraft and operational processes of LM's technical approach. This was particularly impressive when coupled synergistically with LM's innovative business strategy, streamlining innovations and approaches to risk mitigation. The technical approach of the LM proposal creates a whole that is greater than the sum of its parts. These significant discriminators were enhanced by the various other strengths, as detailed above. As discussed previously, I concluded that the offerors were essentially equal in the lowest weighted subfactor, Small Disadvantaged Business Plan, and that LM had an advantage in the subfactor of Safety and Health Plan. Due to its evident superiority in Technical Approach and its advantage in Management Approach, I concluded that LM had a marked advantage over NG in overall Mission Suitability.

Next, I considered Cost. As I noted above, I determined that the difference in cost between the proposals is a compelling consideration in my selection decision. I have determined that the lower-cost LM proposal represents a substantial savings to the Government. Moreover, I agree with the Board's confidence assessment concerning the evaluated probable costs of each offeror.

Finally, I considered Past Performance. There is no better predictor for how the CEV Phase 2 contractor will perform than performance during Phase 1. In that regard, LM's performance during Phase 1 has been exceptional. As noted above, LM has performed proactively and has emphasized positive interaction with the Government during Phase 1.

SELECTION DECISION

Both offerors submitted sound proposals. However, in conducting my in-depth review of all the findings for both offerors, I determined that there are true discriminators, as discussed above, which give LM the clear advantage in Mission Suitability, Cost, and Past Performance. LM's superior approach, when combined with LM's lower cost, amply demonstrates its ability to successfully complete the contract requirements while providing the overall best value to the Government.

As a result of all of the foregoing information and rationale, I select LM for award of the CEV Phase 2 contract. This decision document is the full expression of the logic supporting my source selection decision. It includes my analysis of the comparative strengths and weaknesses of the winning LM proposal versus those of the non-selected NG proposal. In this decision document, I have underscored the information in the findings that I deem most relevant to my selection decision. As evidenced in this decision document, my selection decision is substantiated by the findings of the SEB and is based on my assessment of the proposals and those findings by the SEB that I deem discriminators in my selection decision. My selection decision is based solely on and is wholly consistent with the selection criteria and evaluation framework, including the relative importance of the factors and subfactors as explained in the solicitation and is supported by the SEB findings that I identified as relevant and material to my decision.

Douglas R. Cooke 8-31-2006

Douglas R. Cooke
Source Selection Authority

Date